WHAT IS CLAIMED IS:

1. A method of determining a reference picture and a block mode, the method comprising:

(a) dividing a video data block of a predetermined size into 2M first sub blocks, wherein M is an integer that equals or is larger than 1;

(b) selecting reference pictures for motion estimation on the respective 2M first sub blocks from N reference pictures, wherein N is an integer that equals or is larger than 2;

(c) counting a number of the first sub blocks that use the same reference picture;

(d) determining whether there are two adjacent first sub blocks using the same reference picture when a number of the first sub blocks using the same reference picture is two or more and is (2M-1) or less; and

(e) when there are two adjacent first sub blocks using the same reference picture, determining a reference picture and a block mode depending on whether two motion vectors are similar, the two motion vectors obtained by performing motion estimation on the two respective adjacent first sub blocks.

2. The method of claim 1, wherein when the two motion vectors are similar, (e) comprises:

(e1) dividing the video data block into M second sub blocks by grouping the two adjacent first sub blocks and grouping the other (2M-2) first

sub blocks into groups of two in the direction in which the two adjacent first sub blocks are adjacent to each other;

(e2) determining a reference picture, which is used by the second sub blocks grouped from the two adjacent first sub blocks, as the same reference picture used in (c); and

(e3) performing motion estimation on the second sub blocks using the reference picture determined in (e2).

3. The method of claim 2, wherein when all the first sub blocks, other than the two adjacent first sub blocks, use different reference pictures, (e) comprises:

(e4) performing motion estimation on respective (M-1) second sub blocks, which are grouped by dividing the first sub blocks, other than the two adjacent first sub blocks, into groups of two, using the different reference pictures; and

(e5) evaluating accuracy of the results of motion estimation performed on the respective (M-1) second sub blocks, and determining a reference picture, which is used when obtaining a highest accuracy of the results of motion estimation, as a reference picture for the (M-1) second sub blocks.

4. The method of claim 3, wherein (e) further comprises (e6) comparing an amount of data obtained when performing motion estimation on

the video data block in a mode of the second sub blocks using the chosen reference pictures and an amount of data obtained when performing motion estimation on the video data block in a mode of the first sub blocks using the determined reference picture; and determining the mode of the first or second sub blocks used when obtaining a lesser amount of data as a block mode of the video data block.

5. The method of claim 1, wherein with respect to (e), when the two motion vectors are not similar, the mode of the first sub blocks is determined as a block mode of the video data block.

6. The method of claim 1, where with respect to (e), the two motion vectors are determined to be similar when the difference between coordinate values of the X-axes of the two motion vectors and the difference between coordinate values of the Y-axes of the two motion vectors fall within ranges of respective predetermined limit values.

7. The method of claim 1, wherein the video data block is a 16×16 pixel macro block, the first sub blocks are 8×8 pixel sub blocks and the second sub blocks are 16×8 or 8×16 pixel sub blocks.

8. The method of claim 3, wherein with respect to (e5), the accuracy of the results of motion estimation are determined using values of a

sum-of-absolute-difference (SAD) function which are sums of the differences between values of pixels of the second sub blocks of the video data block and corresponding values of pixels of second sub blocks of the reference picture which correspond to the second sub blocks of the video data block.

9. The method of claim 1, wherein (b) comprises:

(b1) performing motion estimation on the respective first sub blocks N times using the N reference pictures; and

(b2) evaluating accuracy of the results of motion estimation performed on the respective first sub blocks N times, and determining a reference picture, which is used when obtaining a highest accuracy of the results of motion estimation, as a reference picture for the first sub blocks.

10. The method of claim 1, wherein when it is determined in (c) that all the 2M first sub blocks use the same reference picture, further comprising (f) determining a reference picture used by all the first sub blocks as a reference picture used to perform motion estimation on the video data block in a predetermined block mode.

11. The method of claim 1, wherein when it is determined in (c) that all the 2M first sub blocks use different reference pictures, further comprising (g) determining the different reference pictures used by all the first sub blocks as reference pictures used to perform motion estimation on the

respective first sub blocks in a predetermined block mode.

12. An apparatus for determining a reference picture and a block mode, the apparatus comprising:

a block divider that divides an input video data block of a predetermined size into 2M first sub blocks, wherein M is an integer that equals or is larger than 1;

a motion estimator that receives N reference pictures, receives the 2M first sub blocks from the block divider, and performs motion estimation on the respective first sub blocks using the N reference pictures, wherein N is an integer that equals or is larger than 2; and

a reference picture and block mode determination unit that determines a reference picture, which is used when obtaining a highest accuracy of a result of motion estimation received from the motion estimator, as a reference picture for the first sub blocks using the N reference pictures, and N reference values that indicate accuracy of the result of motion estimation performed on the respective first sub blocks N times, and

receives, from the motion estimator, two motion vectors obtained by performing motion estimation on two adjacent first sub blocks using the same reference picture and determines a reference picture and a block mode depending on whether the two motion vectors are similar, when a number of the first sub blocks using the same reference picture is two or more and (2M-1) or less and two adjacent first sub blocks using the same reference picture

are present.

13. The apparatus of claim 12, wherein when the two motion vectors are similar, the reference picture and block mode determination unit determines a reference picture for second sub blocks, which are grouped from the two adjacent first sub blocks, as the same reference picture,

the block divider receives a command of grouping the two adjacent first sub blocks from the reference picture and block mode determination unit, divides the video data block into M second sub blocks by grouping the two adjacent first sub blocks and dividing the other (2M-2) first sub blocks in the direction of the two adjacent first sub blocks into groups of two, and provides the obtained M second sub blocks to the motion estimator, and

the motion estimator receives an index indicating the determined reference picture from the reference picture and block mode determination unit, and performs motion estimation on the second sub blocks, which are grouped from the two adjacent first sub blocks, using a reference picture indicated in the index.

14. The apparatus of claim 13, wherein when all the first sub blocks other than the two adjacent first sub blocks use different reference pictures, the reference picture and block mode determination unit receives, from the motion estimator, a plurality of reference values representative of the accuracy of the result of motion estimation performed on respective (M-1)

second sub blocks, which are divided from the first sub blocks other than the two adjacent first sub blocks into groups of two, using the different reference pictures, and

determines a reference picture, which is used when obtaining the highest accuracy of the result of motion estimation using the plurality of reference values, as a reference picture for the (M-1) second sub blocks.

15. The apparatus of claim 14, wherein the reference picture and block mode determination unit compares the amount of data obtained by performing motion estimation on the video data block in a mode of the second sub blocks using the determined reference picture and the amount of data obtained by performing motion estimation on the video data block in a mode of the first sub blocks using the determined reference picture, and

determines the mode of the first or second sub blocks used when obtaining a lesser amount of data as a block mode of the video data block.

16. The apparatus of claim 12, wherein the reference picture and block mode determination unit determines the mode of the first sub blocks as a block mode of the video data block when the two motion vectors are not similar.

17. The apparatus of claim 12, wherein the reference picture and block mode determination unit determines that the two motion vectors are

similar when the difference between coordinate values of the X-axes of the two motion vectors and the difference between coordinate values of the Y-axes of the two motion vectors fall within ranges of predetermined limit values.

18. The apparatus of claim 12, wherein the video data block is a 16×16 pixel macro block, the first sub blocks are 8×8 pixel sub blocks, and the second sub blocks are 16×8 or 8×16 pixel sub blocks.

19. The apparatus of claim 12, wherein the reference values representative of the accuracy of the results of motion estimation are sum-of-absolute-difference (SAD) values that are sums of the differences between values of pixels of the first sub blocks of the video data block and corresponding values of pixels of first sub blocks of the reference picture which correspond to the first sub blocks of the video data block, respectively.

20. A method of determining a block mode, comprising:

(a) performing motion estimation on an input video data block in a mode of first sub blocks thereof using a predetermined reference picture and a predetermined measure function for motion estimation, and obtaining values of the measure function and motion vectors for the respective first sub blocks;

(b) determining whether there is a need to perform motion estimation on the video data block in a mode of second sub blocks thereof which are smaller than the mode of the first sub blocks; and

(c) when there is no need to perform motion estimation on the video data block in the mode of the second sub blocks, determining a block mode of the video data block depending on whether motion vectors of the first sub blocks are similar.

21. The method of claim 20, wherein (a) comprises:

(a1) dividing the respective first sub blocks into a plurality of second sub blocks and computing values of a measure function with respect to the respective first sub blocks in units of the second sub blocks divided from the respective first sub blocks ; and

(a2) obtaining the values of the measure function of the respective first sub blocks by combining the values of a measure function obtained in (a1).

22. The method of claim 21, wherein (b) comprises:

(b1) determining whether the values of the measure function of the respective first sub blocks are similar; and

(b2) determining that there is no need to perform motion estimation on the video data block in the mode of the second sub blocks when it is determined in (b1) that all the values of the measure function of the respective first sub blocks are similar.

23. The method of claim 20, wherein with respect to (c), a block

mode is determined so that that motion estimation is performed in a unit of the video data block when all the motion vectors of the respective first sub blocks of the video data block are similar.

24. The method of claim 20, wherein the video data block is a 16×16 pixel macro block that is divided into four first 8×8 pixel sub blocks including a leftmost 8×8 pixel sub block and other 8×8 pixel sub blocks located clockwise from the leftmost pixel sub block, and first through fourth motion vectors correspond to the four first sub blocks,

wherein with respect to (c), a block mode for the video data block is determined as a 16×16 block mode when all of the first through fourth motion vectors are similar.

25. The method of claim 24, wherein with respect to (c), the block mode for the video data block is determined as a 16×8 block mode when the first and second motion vectors are similar and the third and fourth motion vectors are similar.

26. The method of claim 24, wherein with respect to (c), the block mode for the video data block is determined as an 8×16 block mode when the first and third motion vectors are similar and the second and fourth motion vectors are similar.

27. The method of claim 24, wherein with respect to (c), the block mode for the video data block is determined as an 8×8 block mode, when a pair of adjacent first sub blocks whose motion vectors are similar is not present, or when motion vectors of a pair of adjacent first sub blocks are not similar although motion vectors of the other pair of adjacent first sub blocks are similar.

28. The method of claim 20, further comprising (d) comparing the amount of data obtained by performing motion estimation on the video data block in the determined block mode and the amount of data obtained when performing motion estimation on the video data block in a mode of the first sub blocks, and

determining a block mode, which is used when obtaining a lesser amount of data, as a block mode of the video data block.

29. The method of claim 20, wherein with respect to (c), the two motion vectors are determined to be similar when the difference between coordinate values of the X-axes of the two motion vectors and the difference between coordinate values of the Y-axes of the two motion vectors fall within ranges of respective predetermined limit values.

30. The method of claim 20, wherein with respect to (a), the motion vectors are determined using a sum-of-absolute-difference (SAD)

function, a sum-of- absolute-transformed-difference (SATD) function, or a sum-of-squared-difference (SSD) function.

31. The method of claim 28, wherein with respect to (d), the amounts of data, which are obtained in the respective block modes, are measured using one of a sum-of-absolute-difference (SAD) function, a sum-of-absolute-transformed-difference (SATD) function, a sum-of-squared-difference (SSD) function, or mean-of-absolute-difference (MAD) function, or a Lagrange function.

32. The method of claim 22, wherein with respect to (b2), when the difference between values of two measure functions falls within a range of a predetermined limit value, the values of the two measure functions are determined to be similar.

33. The method of claim 22, wherein when it is determined in (b1) that there is a first sub block B_k having at least one value of measure function that is not similar to the other values of measure function, wherein k is an integer from 1 to 4, the method further comprising:

(e) determining motion vectors of the respective second sub blocks by performing motion estimation on the first sub block B_k in the mode of the second sub blocks, using the predetermined reference picture and measure function; and

(f) determining a block mode for the video data block by

determining whether motion vectors of a plurality of second sub blocks of the first sub block B_k are similar.

34. The method of claim 33, wherein the video data block is a 16×16 pixel macro block divided into four first 8×8 pixel sub blocks including a leftmost 8×8 pixel sub block and other 8×8 pixel sub blocks located clockwise from the leftmost 8×8 pixel sub block, and

the first sub block B_k is divided into four second 4×4 pixel sub blocks including a leftmost 4×4 pixel sub block and other 4×4 pixel sub blocks located clockwise from the leftmost 4×4 pixel sub block, and

first through fourth motion vectors correspond to the four sub blocks,

wherein with respect to (f), a block mode for the video data block is determined as an 8×8 block mode when all of the first through fourth motion vectors are similar.

35. The method of claim 33, wherein with respect to (f), a block mode for the first sub block B_k is determined as an 8×4 block mode when the first and second motion vectors are similar and the third and fourth motion vectors are similar.

36. The method of claim 33, wherein with respect to (f), a block mode for the first sub block B_k is determined as a 4×8 block mode when the first and third motion vectors are similar and the second and fourth motion vectors are similar.

37. The method of claim 33, wherein with respect to (f), a block mode for the first sub block B_k is determined as a 4×4 block mode, when a pair of adjacent second sub blocks whose motion vectors are similar is not present, or when motion vectors of a pair of adjacent second sub blocks are not similar although motion vectors of the other pair of adjacent second sub blocks are similar.

38. The method of claim 33, further comprising (g) comparing the amount of data obtained by performing motion estimation on the first sub block B_k in the block mode determined in (f) and the amount of data obtained by performing motion estimation on the first sub block B_k in the mode of the second sub blocks, and

determining a block mode, which is used when obtaining a lesser amount of data, as a block mode of the first sub block B_k.

39. An apparatus for determining a reference picture and a block mode, the apparatus comprising:

a block divider that divides a video data block into a plurality of first sub blocks;

a motion estimator that determines values of a measure function and motion vectors of the respective first sub blocks by receiving N predetermined reference pictures, receiving the plurality of first sub blocks from the block

divider, and performing motion estimation on the video data block in a mode of the first sub blocks using the N reference pictures and a predetermined measure function for motion estimation; and

a block mode determination unit that determines a block mode depending on whether motion vectors of the respective first sub blocks are similar, when it is determined that there is no need to perform motion estimation on the video data block in a mode of second sub blocks that is smaller than the mode of the first sub blocks, using a plurality of values of measure function calculated by performing motion estimation on the first sub blocks received from the motion estimator.

40. The method of claim 39, wherein the block mode determination unit receives a plurality of values of the measure function which are calculated in units of second sub blocks of the respective sub blocks and input from the motion estimator, and repeatedly determines whether the values of the measure function are similar with respect to the respective first sub blocks, and

determines that there is no need to perform motion estimation on the first sub blocks in the mode of the second sub blocks when all the values of the measure function are similar.

41. The apparatus of claim 39, wherein the block mode determination unit determines a block mode so that motion estimation is

performed in a unit of the video data block when all motion vectors of the plurality of respective first sub blocks of the video data block are similar.

42. The apparatus of claim 39, wherein the video data block is a 16×16 pixel macro block that is divided into four first 8×8 pixel sub blocks including a leftmost 8×8 pixel sub block and other 8×8 pixel sub blocks located clockwise from the leftmost 8×8 pixel sub block, and first through fourth motion vectors correspond to the four first 8×8 pixel sub blocks,

wherein the block mode determination unit determines a block mode for the video data block as a 16×16 block mode when all of the first through fourth motion vectors are similar.

43. The apparatus of claim 42, wherein the block mode determination unit determines a block mode for the video data block is determined as a 16×8 block mode when the first and second motion vectors are similar and the third and fourth motion vectors are similar.

44. The apparatus of claim 42, wherein the block mode determination unit determines a block mode for the video data block as an 8×16 block mode when the first and third motion vectors are similar and the second and fourth motion vectors are similar.

45. The apparatus of claim 42, wherein the block mode determination unit determines a block mode for the video data block as an 8×8

block mode, when a pair of adjacent first sub blocks whose motion vectors are similar is not present, or when motion vectors of a pair of adjacent first sub blocks are not similar although motion vectors of the other pair of adjacent first sub blocks are similar.

46. The apparatus of claim 39, wherein the block mode determination unit compares the amount of data obtained by performing motion estimation on the video data block in the determined block mode and the amount of data obtained when performing motion estimation on the video data block in a mode of the first sub blocks, and determines a block mode, which is used when obtaining a lesser amount of data, as a block mode of the video data block.

47. The apparatus of claim 39, wherein the block mode determination unit determines that the two motion vectors are similar when the difference between coordinate values of the X-axes of the two motion vectors and the difference between coordinate values of the Y-axes of the two motion vectors fall within ranges of respective predetermined limit values.

48. The apparatus of claim 39, wherein the motion estimator determines the motion vectors using one of a sum-of-absolute-difference (SAD) function, a sum-of-absolute-transformed-difference (SATD) function, and a sum-of-squared-difference (SSD) function.

49. The apparatus of claim 46, wherein the block mode determination unit measures the amounts of data, which are obtained in the respective block modes, using one of a sum-of-absolute-difference (SAD) function, a sum-of-absolute-transformed-difference (SATD) function, a sum-of-squared-difference (SSD) function, and mean-of-absolute-difference (MAD) function, or a Lagrange function.

50. The apparatus of claim 40, wherein the block mode determination unit determines that values of two measure functions are similar when the difference between the values of the two measure functions falls within a range of a predetermined limit value.

51. The apparatus of claim 39, wherein when there is a first sub block B_k having at least one value of measure function that is not similar to the other values of measure function, the block mode determination unit outputs a control signal to the block divider and the block divider divides the first sub block B_k into a plurality of second sub blocks in response to the control signal, wherein k is an integer from 1 to 4,

the motion estimator determines motion vectors of the respective second sub blocks by performing motion estimation on the first sub block B_k in the mode of the second sub blocks, using the predetermined reference picture and measure function, and

the block mode determination unit determines a block mode for the video data block by determining whether motion vectors of a plurality of second sub blocks of the first sub block B_k are similar.

52. The apparatus of claim 51, wherein the video data block is a 16×16 pixel macro block divided into four first 8×8 pixel sub blocks including a leftmost 8×8 pixel sub block and other 8×8 pixel sub blocks located clockwise from the leftmost 8×8 pixel sub block, and

the first sub block B_k is divided into four second 4×4 pixel sub blocks including a leftmost 4×4 pixel sub block and other 4×4 pixel sub blocks located clockwise from the leftmost 4×4 pixel sub block, and

first through fourth motion vectors correspond to the four sub blocks,

wherein the block mode determination unit determines a block mode for the video data block as an 8×8 block mode when all of the first through fourth motion vectors are similar.

53. The apparatus of claim 51, wherein the block mode determination unit determines a block mode for the first sub block B_k as an 8×4 block mode when the first and second motion vectors are similar and the third and fourth motion vectors are similar.

54. The apparatus of claim 51, wherein the block mode determination unit determines a block mode for the first sub block B_k as a 4×8

block mode when the first and third motion vectors are similar and the second and fourth motion vectors are similar.

55. The apparatus of claim 51, wherein the block mode determination unit determines a block mode for the first sub block B_k as a 4×4 block mode, when a pair of adjacent second sub blocks whose motion vectors are similar is not present, or when motion vectors of a pair of adjacent second sub blocks are not similar although motion vectors of the other pair of adjacent second sub blocks are similar.

56. The apparatus of claim 51, wherein the block mode determination unit compares the amount of data obtained by performing motion estimation on the first sub block B_k in the block mode and the amount of data obtained by performing motion estimation on the first sub block B_k in the mode of the second sub blocks, and

determines a block mode, which is used when obtaining a lesser amount of data, as a block mode of the first sub block B_k.

57. A computer readable recording medium for recording a program that executes a method of determining a reference picture and a block mode, wherein the method comprises:

(a) dividing a video data block of a predetermined size into 2M first sub blocks, wherein M is an integer that equals or is larger than 1;

(b) selecting reference pictures for motion estimation on the respective 2M first sub blocks from N reference pictures, wherein N is an integer that equals or is larger than 2;

(c) counting a number of the first sub blocks that use the same reference picture;

(d) determining whether there are two adjacent first sub blocks using the same reference picture when the number of the first sub blocks using the same reference picture is two or more and is (2M-1) or less; and

(e) when there are two adjacent first sub blocks using the same reference picture, determining a reference picture and a block mode depending on whether two motion vectors are similar, the two motion vectors obtained by performing motion estimation on the two respective adjacent first sub blocks.

58. A computer readable recording medium for recording a program that executes a method of determining a block mode, wherein the method comprises:

(a) determining values of a measure function and motion vectors of respective first sub blocks by performing motion estimation on an input video block in a mode of the first sub blocks, using a predetermined reference picture and the measure function for motion estimation;

(b) determining whether the input video data block in a mode of second sub blocks that is smaller than the mode of the first sub blocks; and

(c) determining a block mode for the input video data block

depending on whether motion vectors of the first sub blocks are similar when there is no need to perform motion estimation on the input video data block in the mode of the second sub blocks.